Virtual Observatories and the Grid

Software Facilities for

Particle Astrophysics

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Accomplished and Planned Work

- Steve Kent is co-investigator on iVDGL and NVO.
- This supports one computing professional, for ~4 years. Currently, Neha is working the third year of this.
- Accomplishments: demonstrations of running science applications on GRID+NVO; serve SDSS images using VO protocols; serve SDSS data using GRID protocols.
- Plans: run science applications on the Open Science Grid; facilitate simulation collaborations.
- More people would yield more applications. We are oversubscribed.

Image Data Access

- Images generally need more CPU cycles/byte than catalogs.
- Challenges of an image archive: allow access to a large number of pixels (Tbytes) indexed by a small amount of header information (Mbytes); synchronize archives; mass storage retrieval and replication.
- Future projects will stage data similar to HEP experiments: DES, SNAP, and LSST.
- The Mass Storage groups have the knowledge to deliver reliable applications to manage these archives.

Catalogs

- This is the "data summary tape" level of location, shape, and flux on the sky for physical objects.
- Challenge is to allow recalibration and cross correlation with other catalogs, and efficient access.
- Meta-data (observing quality; area scanned) are essential to analyses.
- Large and Complex Science Databases are rare now, but are essential for cosmological observations.
- It makes sense to draw from the experience of database groups at FNAL to seriously address these challenges.

Dark Energy Simulations

- We submitted a ROSS proposal to NASA, which was not funded, to provide a coherent toolkit for simulation of future missions.
- Current work in use by SNAP and DES.
- The coherent toolkit would serve the role that GEANT4 plays in HEP.
- A dedicated Java programmer would make this a reality in a relevant time frame.

Sum

- Today, SDSS is the significant content provider for virtual observatories. FNAL could take a lead in this.
- Scientific database design, implementation, and operations are crucial for productive analysis.
- GRID applications enable access to current and future large astrophysical data sets. (Note importance of WMAP survey during SDSS.)
- Agile development of data access methods in close collaboration with scientists makes them more productive.